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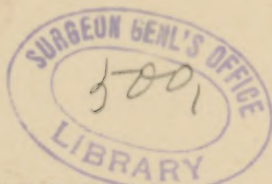


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THE MECHANICAL TREATMENT OF OSTEITIS OF THE KNEE.*

THE term osteitis of the knee, or "white swelling," is used to designate a tubercular, purulent, or mixed process which usually begins in an adjacent epiphysis or in the synovial membrane, and, if unchecked, finally involves most of the joint structures.

Some of the classical symptoms of inflammation—namely, pain, heat, redness, swelling, and impaired function—are less marked in chronic than in acute affections; the first three may be entirely absent at certain stages or in certain types of chronic knee disease. Tenderness, especially circumscribed tenderness, is more constant and of more significance as an indication of osseous involvement, as recently pointed out by Senn; but in all stages of joint disease, where the synovial membrane is irritated, the tonicity of the muscles acting upon the joint is of more importance as an indication of the condition of the joint in difficult or doubtful cases than all the other symptoms put together, and always calls for critical examination. Atrophy of the limb above and below the joint is also a constant symptom.

* Read by title before the American Orthopædic Association at its seventh annual meeting.

Whatever the irritant or pathological process, if continued and involving the joint, certain symptoms regularly appear as the result of reflex spasm acting upon the joint under the mechanical conditions present; and certain deformities regularly accompany chronic inflammation of the knee, as the expression of a tendency to a dynamical equilibrium of the different forces acting upon the joint. The thigh muscles are stimulated through reflected joint irritation, and the flexors being more advantageously placed than the extensors, the knee becomes gradually more and more flexed; from preponderance of the biceps at the outer side of the knee, and from its more advantageous leverage through its insertion into the head of the fibula, the tibia is rotated out and abducted; and as the posterior group of muscles pull the head of the tibia directly backward when the knee is semiflexed, the head of the tibia undergoes the characteristic subluxation backward, there being no adequate force to oppose it—that is to say, the mechanical arrangement of the joint and its muscles favors flexion, eversion, abduction, and subluxation. This is also seen after poliomyelitis, where similar deformities are more gradually produced without spasm.

Under the reflected stimulus of an irritated joint, however, the muscles tend to produce by their exaggerated but irregular tonicity a position of less discomfort—that is, of less tension and less irritation. Volition has little to do with it. If irritation is intense, even in the semiflexed position, flexion may become excessive without relief, and in most untreated cases, where the joint irritation is considerable and long continued, eversion and subluxation and often abduction are gradually produced, clearly unaided and unhindered by volition.

The knee, if considerably damaged and left to itself, gradually becomes more or less fixed in this flexed, everted,

abducted, and subluxated position, from thickening of the ligaments, adhesions, and the adaptations of the hard and soft structures to the deformed position. In certain cases bony ankylosis may finally occur, or the patient may succumb to a complicating tuberculosis, local or general, septicæmia or its sequelæ, or exhaustion. It is also true that milder grades of the affection do occur, which get well with a more or less useful joint under comparatively simple treatment.

The indications for treatment in this affection, and also in chronic synovitis of the knee, are local and general.

The general indication for treatment is to improve the nutrition of the patient, and thus insure a blood supply of good quality to the diseased area to favor the reparative process. The principal means to this end are an abundant supply of fresh air, a nourishing diet, the relief of local irritation, and the correction of complicating disorders. Local mechanical treatment is the mainstay in meeting the general indication, since it relieves the organism of the depressing drag of a constant irritation, whether painful or not, and permits the patient to pass much of the time in the open air. These two elements are powerful aids in stimulating appetite and cheerfulness and in banishing sleeplessness and nervous irritability. One of the most gratifying results of proper mechanical treatment is the marked and speedy gain in general health and vigor.

The local indications for treatment are to provide conditions favoring the process of repair at the site of disease, to prevent or correct deformity, and to restore so far as possible the functions of the joint. They vary according to the stage and grade of the disease and the special features presented, and are met by mechanically protecting the joint from pressure and internal and external traumatism, thus favoring a more normal local circulation; by

gradual correction of the deformity, and later by the protected use of the muscles and joint. In the stage of irritation and disintegration the local circulation is defective and local nutrition is impaired from distention or from articular pressure. The sore joint surfaces are jammed together by abnormal muscular spasm; this increases irritation and local necrosis, multiplies the evil effect of movement and jar, and is unfavorable to the healing process. The mechanical indication is to keep the joint surfaces from pressing and rubbing against each other, in order to allay muscular spasm and prevent injury. This is done by applying mechanical counter extension and fixation to the joint, the patient being kept in bed until the acute symptoms subside. Rest in bed for a time is necessary where much irritation exists, but does not alone meet the local indications. Mechanical counter extension must be added to relieve the pressure upon the tender joint surfaces. This counter extension must be applied with precision in the lines of present deformity or so near them as to be perfectly comfortable. Indeed, if pain is present and rest is disturbed, these symptoms are regularly and promptly relieved by proper counter extension; the relief from pain is often instantaneous, as in the following case:

A young man who had been in such pain for months from an exacerbation of synovial inflammation that he had been kept under morphine, and that his physician and friends had considered it impossible to move him, was finally brought to New York. Fixation alone had been of small avail, but he breathed a sigh of relief the moment the straps of the counter-extension apparatus were tightened, and he remained free from suffering from that time, with coincident subsidence of the inflammation.

The joint then must be put to rest in the strictest sense until all irritation has disappeared, the patient's health has

improved, and we have reason to believe that the healing process is inaugurated. The time spent in bed will be from four to eight weeks, but the splint is applied at once, and worn continuously day and night. When the patient is recumbent a weight of four to eight pounds is attached to the apparatus, which may be so contrived that most of the varying indications at different stages of the disease can be met and the joint controlled at the will of the operator.

The apparatus preferred by the writer consists essentially of Dows's supporting splint, devised by Dr. C. Fayette Taylor, to which are added a snap joint at the knee and a steel circle for fixing or changing the angle of flexion.

By means of the apparatus the knee is supported laterally and fixed at the angle of choice, which must be such that no leverage is exerted, and counter-extension is secured by a perineal strap and by adhesive plasters applied to the leg below the knee. A ratchet or screw extension is not required, as moderate force only is necessary for the knee, much less than for the hip, where the muscles are more powerful, and is obtained by traction on the strap attached to the plaster and secured by a buckle. The leg bar of the apparatus must be rotated to nearly correspond with the eversion, so that no twisting force is exerted on the knee. If the fixation is in the proper position without leverage or torsion, and the traction is properly applied, muscular spasm will relax by degrees, and a corresponding correction should be made in the apparatus. The restoration of local conditions favorable to healing is one indication, and the correction of the deformity another, but the two should proceed coincidently. Allaying muscular spasm by constant traction with fixation and, when necessary, recumbency, permits a gradual and painless rectification of the

deformity in a large number of cases, and as rectification of the deformity progresses, the mechanical conditions for counter-extension and fixation are more readily and perfectly fulfilled, and in many instances the joint is put into a condition more favorable for healing.

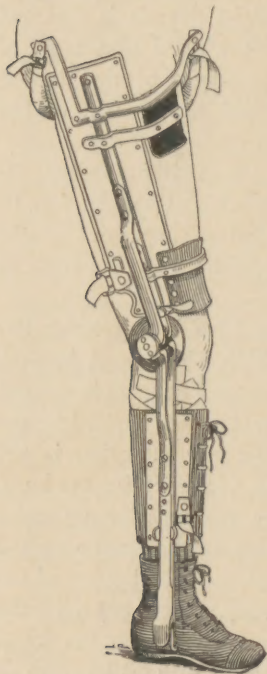


Fig. 1.

Many forms of apparatus are used to meet special indications, but the one we have found most generally useful and most readily adjusted to meet varying indications is the lock-joint supporting and protective apparatus already mentioned (Fig. 1). It is made of steel properly lined with leather, and consists of two bars with an accurate and substantial joint at the knee, which, however, is fixed by a spring during the first stage of the treatment. To the bars are riveted slightly concave steel thigh and leg plates, fitting accurately the external aspect of the limb.

The lower bar, made of two overlapping pieces to allow of adjustment, reaches slightly below the foot and is provided at the lower end with a slip-joint, fitting into an L-shaped steel plate in the shoe, which may be applied and removed without disturbing the brace; the length of the brace is such that considerable space is left between the heel of the foot and the sole of the shoe (Fig. 2.) To the leg-plate is riveted a leather

legging which surrounds the leg, lacing up in front. At the upper end of the apparatus steel horns carry the perineal strap, an anterior thigh plate keeps the apparatus from falling backward, and a knee-plate carried by a curved, protected steel band and fitted above the inner side of the knee prevents lateral motion. A strap above the popliteal space and a buckle on the leg-plate to receive the adhesive plaster webbing completes the apparatus, which should be made of superior materials and workmanship to insure the perfect adaptation and solidity which alone can give the comfort and instinctive confidence necessary to successful management. A slight elasticity or "give" in the apparatus will set the irritated muscles on guard and check progress. A three- or five-tailed adhesive plaster (Fig. 3)* is applied to the outer side of the leg below the

knee before the apparatus is put on. If the knee is sore and inflamed, the patient will still lie in bed after the application of the apparatus to insure perfect rest and absence from jar. When the patient can be moved comfortably with the brace, and inflammatory action seems to be regressive, the patient may be allowed to sit up or walk about on crutches, allowing the affected limb to hang. When healing has progressed still further, the patient may walk between two crutches and finally with a cane, taking the weight upon the perineal strap of the apparatus, which



FIG. 2.

* A Ready Method for Counter-extension at the Knee. By the writer. *Boston Medical and Surgical Journal*, October 16, 1890.

is "itself an ever-present crutch for the purpose of supporting the weight of the body during locomotion." *

When so far advanced toward recovery that inflammation is absent, the knee may be slightly bent when seated by releasing the catch, which, owing to the peculiar construction of the release, can easily be done through the clothing (Fig. 4).



FIG. 3.

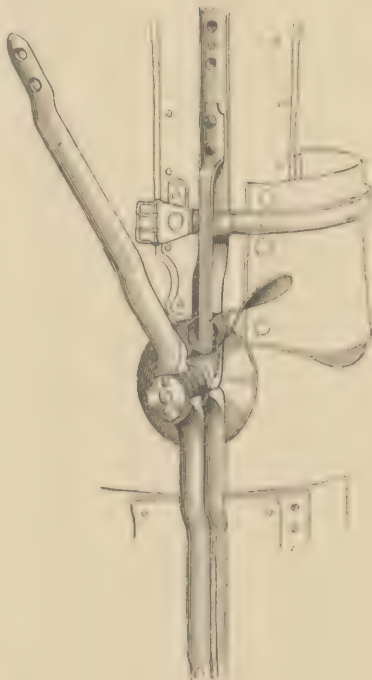


FIG. 4.

Later still the catch may be held open by inserting a rubber or wooden wedge beneath the spring, and the patient

* On the Mechanical Treatment of Synovitis of the Knee Joint. Dr. C. Fayette Taylor. *New York Medical Journal*, July, 1893.

may be allowed to use the knee with motion, which may be confined within selected limits by placing steel stops on the joint disc, the delicate, newly-healed joint structures being protected from friction and superincumbent weight and from lateral strain by the apparatus with its load-bearing perineal strap. Preparatory to discontinuing the use of the apparatus, the weight of the body may by degrees be allowed to rest upon the knee by lengthening the perineal strap and by shortening the leg-bar, so that the heel is allowed to approach or touch the sole of the shoe. It is believed that the gradual introduction of the muscles and joint to their natural function is not only safer than an abrupt change from fixation to walking without support, but that the prescribed graduated use of the muscles and joint without harmful friction, in the absence of inflammation, is itself a remedial measure of high value in the recovering stage, through its effect in improving the circulation and nutrition of the parts, thus favoring their more perfect restoration.

Nothing could be further from the purpose of this paper than to advocate any particular form of apparatus as pre-eminently excellent in the treatment of osteitis of the knee; rather the intention has been to emphasize the varying indications presented by the disease in its different stages, which may be met in different ways once the principle of continued positive protection with the allaying of local irritation is recognized. The elements of protection vary with the different stages of the disease. The continued use of protective apparatus, properly manipulated, not only fulfills the local indication for enforced rest to the joint, but does so with a minimum of confinement, enabling the patient at an early stage of the treatment to move about and get an abundance of pure air, than which no general measure is more important. The knee is practically put to bed while

the patient is up and moving about. "In a word, to be master of the situation, and to be ready and able to respond to all indications, separately or at the same time, constitute the problem of the mechanical treatment"* of chronic disease of the knee joint.

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* *Loc. cit.*

